

# CLAIMS

What is claimed is:

eg PMMA, polystyrene or polycarbonate

1. A porous polymer prepared by polymerization of one or more polymerizable components around a colloidal template followed by the selective removal of said colloidal template.

2. The porous polymer of claim 1 wherein said colloidal template is an ordered, monodisperse colloidal template and said porous polymer is an ordered, monodisperse macroporous polymer.

3. The ordered, monodisperse macroporous polymer of claim 2 wherein said ordered, monodisperse colloidal template comprises silica particles.

4. The ordered, monodisperse macroporous polymer of claim 3 wherein said silica particles are silica nanospheres having diameters of between 200 and 700 nm and said ordered, monodisperse colloidal template is prepared by convective self-assembly.

5. The ordered, monodisperse macroporous polymer of claim 3 wherein said selective removal is accomplished using hydrofluoric acid.

6. The ordered, monodisperse macroporous polymer of claim 2 wherein said ordered, monodisperse colloidal template comprises polystyrene particles.

7. The ordered, monodisperse macroporous polymer of claim 2 wherein said ordered, monodisperse macroporous polymer comprises a material selected from the group consisting of poly(methyl methacrylate) and polystyrene.

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8. The ordered, monodisperse macroporous polymer of claim 2 wherein said polymerization is accomplished by heat or by ultraviolet light.

9. The porous polymer of claim 1 wherein said colloidal template comprises silica particles or polystyrene particles.

10. A second-generation colloid prepared by

(a) polymerizing one or more polymerizable components around a first-generation colloidal template;

(b) selectively removing the first-generation colloidal template to yield a porous polymer;

(c) depositing a material into the pores of the porous polymer; and

(d) selectively removing the porous polymer.

11. The second-generation colloid of claim 10 wherein the porous polymer is an ordered, monodisperse macroporous polymer and the second-generation colloid is an ordered,

monodisperse colloid.

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5 12. The second-generation colloid of claim 11 wherein said second-generation colloid comprises a ceramic material.

13. The second-generation colloid of claim 11 wherein said second-generation colloid comprises a material selected from the group consisting of alumina, titania and zirconia.

10 14. The second-generation colloid of claim 11 wherein said second-generation colloid comprises an inorganic salt.

15. The second-generation colloid of claim 11 wherein said second-generation colloid comprises a material selected from the group consisting of cadmium sulfide and silver chloride.

elastic species 15 16. The second-generation colloid of claim 11 wherein said second-generation colloid comprises a metal.

17. The second-generation colloid of claim 11 wherein said second-generation colloid comprises a material selected from the group consisting of nickel and gold.

20 18. The second-generation colloid of claim 11 wherein said second-generation colloid

comprises a polymer.

19. The second-generation colloid of claim 11 wherein said second-generation colloid comprises a material selected from the group consisting of poly(p-phenylene vinylene), polypyrrole, poly(methyl methacrylate) and polystyrene.

20. The second-generation colloid of claim 11 wherein said second-generation colloid comprises spherical particles.

21. The second-generation colloid of claim 11 wherein said second-generation colloid comprises ellipsoidal particles.

22. A method for preparing a porous polymer comprising the steps of:

- (a) providing a colloidal template;
- (b) infiltrating said colloidal template with polymerizable components;
- (c) polymerizing said polymerizable components; and
- (d) selectively removing said colloidal template to yield a porous polymer.

23. The method according to claim 22 wherein said colloidal template is an ordered, monodisperse colloidal template and said porous polymer is an ordered, macroporous polymer.

24. The method according to claim 23 wherein said ordered, monodisperse colloidal template comprises silica particles.

5 25. The method according to claim 24 wherein said silica particles are silica nanospheres having diameters of between 200 and 700 nm and said ordered, monodisperse colloidal template is prepared by convective self-assembly.

26. The method according to claim 24 wherein step (d) is accomplished using hydrofluoric acid.

27. The method according to claim 23 wherein said ordered, monodisperse colloidal template comprises polystyrene particles.

28. The method according to claim 23 wherein said ordered, monodisperse macroporous polymer comprises a material selected from the group consisting of poly(methyl methacrylate) and polystyrene.

29. The method according to claim 23 wherein said step (c) is accomplished by heat or by ultraviolet light.

30. A method for preparing a second-generation colloid comprising the steps of:

- (a) providing a colloidal template;
- (b) infiltrating said colloidal template with polymerizable components;
- (c) polymerizing said polymerizable components;
- (d) selectively removing said colloidal template to yield a porous polymer;
- (e) depositing a material into the pores of said porous polymer; and
- (f) selectively removing said porous polymer.

31. The method according to claim 30 wherein said colloidal template is an ordered, monodisperse colloid; said porous polymer is an ordered, monodisperse macroporous polymer; and said second-generation colloid is an ordered, monodisperse colloid.

32. The method according to claim 31 wherein said second-generation colloid comprises a ceramic material.

33. The method according to claim 31 wherein said second-generation colloid comprises a material selected from the group consisting of alumina, titania and zirconia.

34. The method according to claim 31 wherein said second-generation colloid comprises an inorganic salt.

35. The method according to claim 31 wherein said second-generation colloid comprises a material selected from the group consisting of cadmium sulfide and silver chloride.

36. The method according to claim 31 wherein said second-generation colloid comprises a metal.

37. The method according to claim 31 wherein said second-generation colloid comprises a material selected from the group consisting of nickel and gold.

38. The method according to claim 31 wherein said second-generation colloid comprises a polymer.

39. The method according to claim 31 wherein said second-generation colloid comprises a material selected from the group consisting of poly(p-phenylene vinylene) and polypyrrole.

40. The method according to claim 31 wherein said porous polymer comprises a material selected from the group consisting of poly(methyl methacrylate) and polystyrene.

41. The method according to claim 31 wherein said second-generation colloid comprises spherical particles.

42. The method according to claim 31, further comprising the step of deforming said porous polymer so that said second-generation colloid comprises ellipsoidal particles.

I 43. A substrate for micro-filtration comprising a porous polymer prepared by polymerization of one or more polymerizable components housing a colloidal template followed by the selective removal of said colloidal template.

II 44. An optical bandgap material comprising an ordered, monodisperse colloid prepared by first depositing a material into the pores of a porous polymer prepared by polymerization of one or more polymerizable components housing an ordered, monodisperse colloidal template and second selectively removing said colloidal template.